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Inscribing and De-scribing Values into Welfare Technology: the Development of an Analytical Framework

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Abstract: Digitalization is currently a focal area among Scandinavian governments and has also been prioritized in welfare organizations. Welfare technology is well granted by governmental investments and includes technologies used in care by caregivers, patients, and their relatives. Earlier research has highlighted negative effects of welfare technologies in care as it decreases efficiency and leads to an excessive focus on technological determinism. To better understand this critique, this study presents an analytical framework that can be used to analyze actor values in relation to welfare technology design, implementation, and use. By providing this knowledge, this paper aims to illustrate the negative effects of welfare technologies in a deeper sense and to investigate if there is an explanation among the background of the actors.

Keywords: Actors, Digitalization, Care, Values, Welfare technology.

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1. Introduction

Digitalization has been a focal area among the Scandinavian countries since the early 20th century, which has led to a rising number of governmental investments. A few examples in Sweden are the Agency for Digital Government (DIGG) founded in 2018, the Swedish eDelegation (2009–2015), and the IT Commission (1998–2003). The Swedish government highlights a certain type of technology called welfare technology. In 2018, a 350 million SEK grant was approved to increase its usage in health care, care, and social service (Socialstyrelsen, 2018). The term welfare technology has been identified as vague (Brynn, 2016) because it overlaps with other terms such as impairment aid and e-health (Kunskapsguiden, 2020). Both caregivers and care receivers can use welfare technologies in the form of planning systems, alarms, cameras, robotic kittens, video solutions, and communication tools. Welfare technology has received critique for its effects, especially on care workers. It has shown to decrease efficiency instead of increasing it (Hägglund et al. 2006; Mariam 2013). The use of welfare technology has also challenged caregivers' own definitions of quality care by shifting their focus toward performance-based values (Brebner et al. 2005; Jansson 2007; Broens et al. 2007; Scandurra et al. 2005; Wälivaara et al. 2011; Tinker & Lansley 2005). Other researchers have highlighted the risk of elderly care organizations becoming victims of technological determinism, which is the constant pursuit of the latest technologies (Frennert, 2020). According to Frennert (2020),

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there is a need to continue to describe and analyze appropriate methods and processes for implementing welfare technology in municipal eldercare organizations.

To demonstrate why welfare technologies have negative effects on care workers, this paper identifies the actors related to these technologies (the *designer*, *decision maker*, and *user)* and examines the values of these professions using community of practice theory. It then describes the history of how technology has affected the way different professions view it. Next, the methodology is described. Finally it presents an analytical framework, influenced by Orlikowski's (1992) structural model of technology, to analyze how different actors inscribe and de-scribe their values onto welfare technology on a discursive level. This is a first step in understanding how actor values affect welfare technology during design, implementation, and use.

2. Humans and Technology

As with other technologies, welfare technologies are designed, implemented, and used by humans. To describe humanity's relationship with technology, Orlikowski (1992, p.405) presents the concept of dualism of technology, which represents the non-linear recursive notion of technology as it is created and changed by human action, yet also used by humans to accomplish some action. This concept describes how technologies and humans engage in an ongoing exchange of actions, and how humans repeatedly institutionalize and objectify technologies. This continuous change tends to be suppressed in organizational discourse in favor of dualism of technology which emphasizes only one view of technology. From the duality of technology, technologies are also interpretatively flexible, which means that the interaction between organizations and technology is a function dependent on the different actors and contexts implicated in the technology's development and use. Orlikowski (1992) uses the term interpretive flexibility, following Pinch and Bijker (1987), to refer to the degree to which users of a technology are engaged in its constitution (physically and/or socially) during development or use.

The understanding of technology as being dependent on its actors is not an obvious or common view among the humanistic and deterministic knowledge traditions. Feenberg (1999) describes how parts of the deterministic knowledge tradition have evolved to include progressive thinkers seeing competing social groups and nations as a proxy for humanity, ignoring the fact that technologies have political impacts. This has led some to view technology as neutral, to connect technological advancement to the advancement of humankind, thereby driving technology further away from political controversy. As the success of technology and data in today's society has led to great effects on human social life, with obvious political impacts, this view can be questioned.

2.1 Communities of Practice (CoP)

Differing views about technology found in deterministic and humanistic knowledge traditions characterize different professions' conceptions of welfare technology. Research has shown that, depending on knowledge background, different actors define welfare technology differently. For example, in a study by Hasselblad (2020), IT and telecom companies (the designers of welfare technologies, such as engineers and computer scientists) define welfare technologies with values

such as streamlining, rationalization, and productivity improvements, while the Swedish auxiliary institute (the users of welfare technologies, such as patients and caregivers) define welfare technologies with values such as security, activity, and participation. The different actors that exist in relation to welfare technology are *designers*, *decision makers*, and *users*. They each represent their own community of practice (CoP) in their relationship to welfare technologies, which is described as groups of people informally bound together by their shared expertise and passion for a given subject (Wenger, 2011). For example, a nurse in elder care or an engineer developing a certain type of hearing aid technology are both part of distinct communities of practice. The three different actors from CoP theory are identified by the following professions:

Designers: Designers of welfare technologies are often identified as various types of engineers or computer scientists depending on the type of welfare technology (e.g., sensors, cameras, robots, or pill distribution tools).

Decision makers: Decision makers, such as managers and politicians, determine what type of welfare technologies should be implemented and where.

Users: Users are care organization professionals, such as care workers, who use welfare technologies. (Users can also be care receivers and relatives but in this thesis, users are identified as care workers as a delimitation.)

Each of these three actors exist in their own CoP which contributes to their individual perspective on the purpose of welfare technologies. *Designers*, recognized as engineers, computer scientists, or system developers, tend to take on a functional, rationalistic perspective, which contributes to a lack of understanding of the human elements in the systems (Stapelton et al., 2005). Stapelton et al. also point out the importance of tacit knowledge in technology development activities and argue that the current emphasis on knowledge as information (or even data) is based on a rationalism, which is inappropriate for knowledge treatment in the context of human-centered-systems thinking. In other words, tacit knowledge contributes to certain assumptions connected to functional rationalism, which currently dominates systems-engineering methodologies and contributes to a development procedure that neglects the humans the technologies are designed to serve.

The *decision maker* is identified as the manager or politician deciding which welfare technologies to implement. Decision makers also choose which care organizations will be provided grant money and how capital will be distributed. According to Larsson (1997), certain types of management values exist which differ between the public and private sectors. Management values observed in the private sector are speed, efficiency, and effectiveness, while management values observed in the public sector are equality, accountability, and control. The NPM movement, which is the belief in economic rationality to create a more effective public sector according to performance targets, has influenced the public sector to implement a more market-based logic, and the management values found in the public sector are, to some extent, becoming increasingly influenced by private-sector management values. This means that management perspectives on the purpose of welfare technologies are, in some sense, influenced by market competition because managers want to do their jobs as well as possible, which includes creating organizations that are efficient in terms of both time and money.

Techno-economic rationality, which describes the common perspectives of designers and managers, is related to the rationalistic perspective in combination with the advancement of technology and capital (Avgerou, 2000). It derives from modernity, which is strongly connected to digitalization as a result of the progress of the Enlightenment ideal from which scientific and technical advances have derived. Avgerou (2000) critiques the techno-economic values that are assigned a prior status due to the focus on rationality, meaning that in certain cultures and contexts values may not be rational at all. He also sees technical and rational knowledge as concerned with systematic reasoning and governing of practice through methods, techniques, and technologies. This knowledge addresses three main concerns – software construction, administrative control, and economic gain – referred to here in their most frequently occurring, intertwined form with the generic term technical rationality.

A perspective substantially different from techno-economic rationality is the user perspective; *users* are identified in this paper as care workers. This perspective exists in a CoP of nursing and focuses on providing care and help to people in need, such as people who are elderly or impaired. This means that care workers, unlike engineers and managers, are not driven by techno-economic rationality but are instead motivated by the interpretative knowledge tradition, meaning they understand that every care situation is individual and that the use of universal economically advantageous solutions is not prioritized over quality care.

3. Methodology

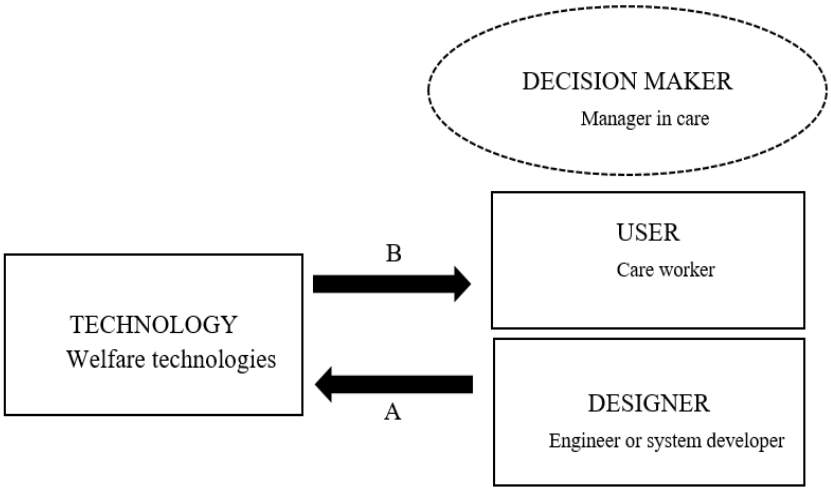
This study presents an analytical framework aimed to be used for analyzing values among actors related to welfare technology. This is achieved by combining the actor-technology-relation part of Orlikowsik's (1992) structural model of technology with the diverse professional values identified in CoP theory. This combination facilitates a deeper analysis of how the professional values of actors effect different stages of design, implementation, and use of welfare technologies. Since different actors are related to different their professional values will affect how each stage is executed and what values are incorporated.

Values are the fundamental base and driving force for decisions and actions, and they have the ability to conflict with or support each other (Keeney, 1996). This paper uses value theory to identify and create value profiles representing the different professions (CoPs) identified as actors in relation to welfare technologies and applicate them onto the framework. The CoPs value profiles are created using previous literature to identify characterizing driving forces among the actors' different decisions and actions. This derives from the authors belief that the actor values effect the way welfare technologies are designed, implemented, and used. By using value theory in combination with CoP theory in the analytical framework, these profession-dependent values can be put into context and subjected to theoretical value analysis. The application of values are illustrated with an real world example using 'bed sensors'.

4. The Structural Model of Welfare Technology

The development of the analytical framework shown in Figure 1 was influenced by the structural model of technology by Orlikowski (1992), which aims to analyze relationships among actors – technology designers, users, and decision makers. In Figure 1, Orlikowski's model is adjusted and applied in a welfare technology context in which the technology is identified as a welfare technology, the designer as an engineer, the user as a care worker, and the decision maker as a manager in care. Arrows A and B represent relationships. Relationship A portrays technology as a product of human action; technology is an outcome of such human actions as design, development, appropriation, and modification. Relationship B depicts technology as a medium of human action; technology facilitates and constrains human action through the provision of interpretative schemes, facilities, and norms (Orlikowski's, 1992 p. 410).

Figure 6: Analytical framework applied in a care context.



Relationship A describes how technology cannot be treated as a neutral tool because it is an outcome of human action. Users are affected by the assumptions and intentions of the designers because they have inscribed their vision and values into the technologies. Akrich (1992) illustrates how technologists define the characteristics of their objects by making hypotheses about the entities that make the world in which the objects are to be inserted. In other words, designers inscribe their vision of the world into the technical content of the new object, creating a script. These visions can, for example, be assumptions about the end users' specific tastes, competence, or aspirations. But assumptions about morality, technology, economy, or science will evolve in particular ways. In this sense, the design of technology is guided by the values of the designer, which in their turn lead to inscriptions in the technology.

Relationship B describes how technology provided to a user both constrains and facilitates human action. This means that the inscriptions made by the designer's assumptions create a script that will both constrain and facilitate actions of the users. To explain this, Akrich (1992) writes of the

notion of 'de-scriptions,' meaning that we need go back and forth between the designer and the user to distinguish between the designer's projected user and the real user and then to compare the world inscribed in the object and the world de-scribed by its displacement.

Section 2.1 identifies values characterizing the actors in relation to welfare technology using CoP. Applied in the structural model of welfare technology (fig. 1), the model enables an analysis of how these values affect the design, implementation, and use. The designers, such as engineers and computer scientists, are motivated by a deterministic knowledge tradition, which means they tend to view technologies as neutral. Combined with a rational perspective and a focus on economic aspects, designers characterize welfare technology using techno-economic rationality values. This leads to welfare technologies that have been inscribed (arrow A) with techno-economic rationality values. This results in the development of technologies that aim to be highly technical, focus on profit, and provide a rational solution.

Decision makers, such as managers and politicians, are affected by management values characterized by the NPM movement toward performance measures and they aim to provide a more efficient public sector. This also includes techno-economic-rationality values, as managers are often restricted by budget constraints. By making decisions and taking actions based on techno-economic rationality, welfare technologies influenced by decision makers will provide solutions that aim to increase profit, be highly technical, and contribute to increased performance according to measurable statistics rather than opinions and assessments from users.

Users, such as caregivers, diverge from designers and decision makers by holding a perspective that is not founded on techno-economic-rationality values, but instead derives from humanistic values as they focus on the individuality of each care situation. From a user perspective, the technology aims to satisfy the individuality of each care situation. This perspective often conflicts with the aim of techno-economic rationality, which focuses on technological advancement and profit. Users represent actors that de-scribe welfare technology, meaning that they interpret the functionality of the technology, and the technology can facilitate and constrain their work as a care giver. De-scribing the designers' scripts can become problematic for users as they derive from different knowledge traditions and therefore have separate views regarding the purpose of welfare technology. In other words, welfare technology design and implementation are characterized by values found in techno-economic rationality, while the usage takes on more humanistic values, by focusing on individuality of each care situation. This difference can, to some extent, contribute to understanding the negative effects regarding welfare technology usage in care organizations.

4.1 A Practical Example

To illustrate the usefulness of the framework this chapter applies it on practical example from care involving a bed sensor. During the development of care beds with sensors to determine whether an elderly person needs to have an overflowing diaper changed, the engineering team developed extremely sensitive sensors to warn of the smallest drop of liquid. These extremely sensitive sensors sounded an alarm not only for an overflowing diaper but also for a small drop of sweat. This contributed to unnecessary work for caregivers, who wanted the sensors to be much less sensitive. The engineers did not see the point of making the sensors less sensitive, as that would amount to a

decrease in the sensor performance. From the perspective of relationship A (figure 1), the sensitivity of the sensors is an output from the designers represented by the engineers. For relationship B, the sensors constrained the caregivers by prompting additional, unnecessary work. This means that the engineers are inscribing their vision (stemming from certain assumptions about users) onto the welfare technology, which may not be intentional. What assumptions are made depends on the values the designer incorporates and often derives from professional norms. In the same way, the decision maker makes assumptions about what welfare technology to implement based on the values they see as important to performing their work as well as possible. The users are those affected by the values the designer inscribes onto the welfare technology, which facilitate or constrain the users' work.

5. Concluding Remarks

This paper introduces an analytical framework that enables value comparison among the various actors related to welfare technology. The framework is influenced by Orlikowski's (1992) structural model of technology combined with value theory applied on actor professions using CoP. The creation of the framework is motivated by a critique of the negative effects of welfare technologies, namely the decrease in care efficiency and the excessive focus on performance-based measures. The resulting framework identifies the diverse values inscribed and de-scibed by the actors. Designer and decision maker professions such as engineers, computer scientists, and managers are motivated by knowledge traditions characterized by techno-economic rationality and therefore also inscribe such values onto the design and implementation of welfare technologies. This affects the users (caregivers) as they derive from humanistic values, which focus on the individuality of each care situation. This separation is illustrated by using a bed sensor example, which theoretically points out the problem of diverging values among actors regarding design and usage. The example also shows the usability of the framework in a structured way as it enables a values analysis among welfare technology actors. These results contribute to existing welfare technology research and will also be useful in future research regarding how to understand the multiple values among actors using empirical material from practice.

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